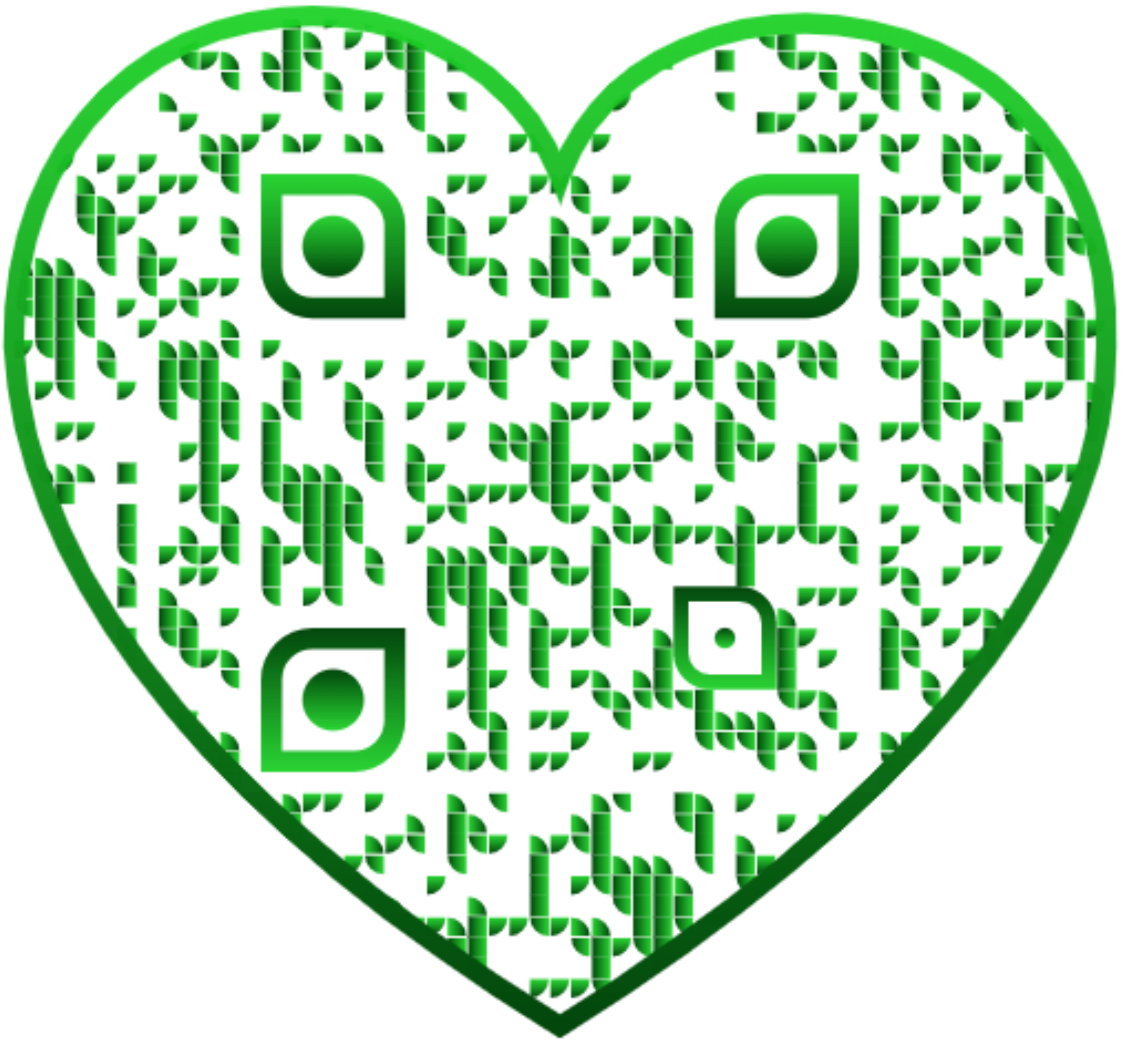
Inventory Management and Control



Inventory Management (IM)

- **Inventory management (IM):**
  - Refers to the process of ordering, storing, using, and selling of pharmaceuticals.
  - It is approach for keeping track of the flow of inventory
  - IM for pharmaceutical supply sounds easy; all that must be done is to order, receive, store, issue, and then reorder a limited list of items.
    - ✓ In reality, the task is difficult, and in many countries,
      - ✓ Poor IM in the public pharmaceutical supply system leads to waste of financial resources, shortages of some essential medicines or overages of others resulting in expiration, and decline in the quality of patient care.

Inventory Management (IM)

- **Purpose of an Inventory Control System**
  - To determine **when** stock should be ordered/issued
  - To determine **how much** stock should be ordered/issued
  - To **maintain** an appropriate stock level of all product
- A **well designed** and well **operated** inventory control system;
  - Prevents **shortages**, **oversupply**, and **expiry** of pharmaceuticals

Issues to be considered during designing or upgrading IM

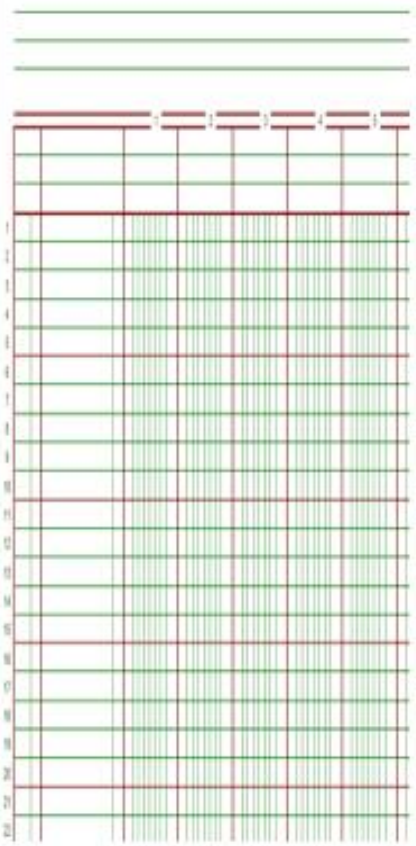
1. **Defining** the context of IM system must function
   - **Independent** vs **Dependent** demand system
   - **Pull** or **push** distribution system

2. Determination of the **type** of stock records and **inventory** reports needed
   - **Stock** records
     - **Primary** source of information
     - Can be manual or computerized
     - Commonly used manual records
       - **Vertical** file records
       - **Kardex** system
       - **Ledger** system

Kardex system

Vertical file records

Ledger



Stock keeping records

- **Purpose of stock keeping records?**
  – To record information about items in storage.
- **What essential data items do stock keeping records contain?**
  - Quantity of **stock on hand**
  - Quantity of **losses** and **adjustments**.
  - Products stored in a storeroom and generally are not distributed (dispensed) directly from the storeroom to the customer

Stock keeping records…

- **When are entries to stock keeping records made?**
  - whenever products are **received** or **issued**.
  - when stock is **counted** during a physical inventory.
  - When the stock keeping record is full, a new record is started using the ending balance from the previous record.

Stock keeping records…

- **How are the data on a stock keeping record organized?**
  - Stock keeping records are organized by **date**.
  - They record *receipts, issues, losses and adjustments, and the balance on hand.*
  - They also record the results of physical inventories (when items are counted to verify the quantity in storage).
- **In what formats are stocks keeping records printed?**
  - Two stock keeping records are used in the inventory management
    - **Bin** Card and **Stock** Record Card

Stock keeping records…

A. BIN CARD

Name of Health Facility: _____

Product Name, Strength and Dosage Form _____

Unit of Issue: _____

Maximum Stock Level: _____ **Emergency Order Point:** _____

Average Monthly Consumption (AMC): _____

Date	Doc. No. (Receiving or Issuing)	Received from or Issued to	Quantity				Batch No.	Expiry Date	Remarks
			Received	Issued	Loss/Adj	Balance			

Inventory Control/Management system…

- **Bin card**
  - Is an individual stock keeping card that keeps information about a single lot of a product.
  - One bin card should be maintained for each:
    - Pack size, form or presentation or dosage form of each commodity.
  - Bin cards are **usually displayed at the bins (or shelf) where the product is found.**

Issues to be considered

- Good to **maintain** stock records for each item
  - To improve **accuracy** and **accountability**
- Typically, **bin** card is combined with **ledger**, **kardex** or computer system
- Computerized
  - Efficient to manage inventory with perpetual or periodic purchasing
  - Easy to retrieve information
  - Easy for reporting
- **NB!** Stock records (manual or computerized)
  - Must be current and accurate
  - Stock count: Reordering purpose and determining inventory value

Issues to be considered…

- Stock count can be done
  - Annually
  - Cyclic counting → best
    - No shut down of warehousing and distribution
    - Relatively easy to trace discrepancy if it arise
  - Methods of cyclic counting
    - Assign counting frequency and timing: ABC category
    - A system of rotating d/t staff members

Issues to be considered….

- **Report from storage facilities**
  - **Stock** position (on hand, on order)
  - **Beginning** and **ending** inventory value, average inventory holding **cost**
  - Value of supplies **issue** and **received**
  - **Change** in **inventory value** and any discrepancy noted during stock count
  - **Consumption pattern**
  - **Service** level (from supplier to medical store to health facility)
  - Medicines at **risk of expiry**

Issues to be considered…

- Purchasing and financial departments
  - **Budget** status
    - Year to date **expenditure** vs **target**
    - Amount **remaining**
  - Purchase and expenditure by **supplier** and **operating** unit
  - Summaries **of account payable** to supplier
  - Status of **outstanding order**
  - Comparison
    - Actual vs expected **lead time**
    - Actual price vs projected **cost**
    - Item purchased and need of **projection**

Selection of items to be stocked as standard items

- **Reason to hold stock**
  - ✓ To ensure availability
  - ✓ To maintain confidence in the system
  - ✓ To reduce the unit cost of medicine
  - ✓ To avoid shortage cost
  - ✓ To minimize ordering cost
  - ✓ To minimize transport cost
  - ✓ To allow fluctuation in demand
- **Disadvantage of holding high stock**
  - – Capital can be tied up in inventory → unavailable for other purpose
  - – Cost (personnel, utilities, insurance, storage facilities and other)
  - – Loss (spoilage, expiry, obsolescence, theft)

Selection of items to be stocked…

- **Which item to be stocked?**
  - **Stock** movement (high vs low): ABC analysis Vs VEN system
- **Level** of use
  - Aspirin, Anticancer (all level vs tertiary care hospital)
- **Local** availability
- **Maintenance of appropriate level for different class of items**
  - **Service level**:
    - percentage of individual items ordered from a supplier or warehouse that is issued from stock on hand
      - Service level= (# items issued/# items requested) x 100

Selection of items to be stocked…

- **Adoption of a decision rule or a model for determining when to order and determining how much to reorder**
- To help maintain adequate stock levels for each health facility in the system
  - **Maximum months of stock**
  - **Minimum months of stock**
  - **Emergency order point**

Selection of items to be stocked…

- **Maximum months of stock**

  – It is the **largest** amount of each pharmaceutical a **facility** should hold at **any one time**.

  - overstocked and expired

- **Minimum months of stock**

  – It is the approximate level of **stock on hand** at the end of the **reporting** period when an order is place

- **Emergency order point**

  – It is the level where the risk of stocking out is likely, and an emergency order should be placed immediately

Inventory Control: Objectives

Objectives of Inventory Control
To supply drug in time.
To reduce investment in inventories and made effective use of capital investment.
Efforts are made to procure goods at minimum price without bargaining the quality.
To avoid stock out and shortage.
Wastage are avoided.

Example: Health logistics system of Ethiopia

Level	Review Period	Maximum Months of Stock	Minimum Months of Stock	Emergency Order Point
HC and Hospitals	Every other month	4 months	2 months	0.5 months (= 2 wks)
Health Posts	Monthly	2 months	1 months	0.25 months (= 1 wk)

Max-Min inventory Control Systems

- **Determining How Much to Order or Issue**
  - **Stock Status**
    - **Purpose** of assessing stock status is to determine **how long supplies will last**.

How much we have of a certain product = How long that product will last(in # of periods
How much we use during a given period

$$\frac{\text{Stock on hand}}{\text{Average monthly consumption}} = \text{Months of stock on hand}$$

Max-Min inventory Control Systems…

- **Calculating Order or Issue Quantities**
  - **Order/issue quantity = Max stock quantity – stock on hand**
- If a facility, for some reason, has not received the previous order or issue, but is positive that stock will arrive, they should subtract the quantities expected from the next resupply quantity.
  - **Order/issue quantity = Max stock quantity – stock on hand - quantity on order**

Max-Min inventory Control Systems…

- **Example on Forced ordering ICS**

  – Calculate the quantity of Chloroquine to order if the maximum stock level for Chloroquine is 4 months and an EOP of 1 month. One case of 300 Chloroquine was ordered and has not yet been received. Use an average of the last 6 months data for your calculations.

Max-Min ICS….

Chloroquine Dispensed to Users	
October 11	178
November 11	552
December 11	540
January 12	846
February 12	630
March 12	578
April 12	812
May 12	508
Balance of Chloroquine on hand May 30, *2013 is 756 tablets*	

Max-Min ICS…

- **Step 1:** Calculate average monthly quantity of Chloroquine consumed

  AMC = Total Chloroquine tabs/6 months = 3914/6=652 tabs per month

- **Step 2:** Calculate reorder quantity
  - Max cons Qty = AMC(652) X MAX months (4) = (2608)
  - **Order Quantity** =max Qty(2608)-SOH (756)-SO(300)=1552
    - **Order Quantity** =1552

Types of Maximum-Minimum ICSs

- **Three Types of Max-Min ICSs**
  - **1. Forced-ordering system**
  - **2. Continuous review system**
  - **3. Standard system**
  - The **same formula** is used to determine how much to order or issue for each of the systems
  - The basic difference between the systems is the **trigger** for ordering or issuing
    - In a **forced-ordering system**: **end of the review period**
    - In a **continuous review system**: when the **facility reaches the minimum** level.
    - In a **standard system**: **end of the review period** for the commodities that are at the **minimum** level

Types of Max-Min ICS…

- **1. Forced-ordering Max-min system**
  - The inventory control system of **Ethiopia**.
  - All facilities are required to report on a **fixed schedule** for all products
    - Health Posts - **monthly**
    - Health Centers and Hospitals- **every other month**
- **Storekeeper decision rule to** resupply
  - At the end of each review period, review all stock levels and order or issue enough stock to bring the levels up to the **max**.
  - **Place an emergency order** if the stock level for **any** item falls **below** the emergency order point **before the end of the review period**.
  - All products are re-supplied each time a report is completed

Types of Max-Min Inventory Control Systems…

- **Advantages of forced-ordering max-min system**
  - Rule for resupply is **simple**
    - order/issue every item at the **end of the period.**
  - Easier to ensure the availability of transport resources
    - b/c orders are placed at regular intervals
  - Every facility orders or is **resupplied at the end of every review period**
  - **No** need of storekeepers **constantly assess stock status**, unless they think a potential stock out is possible
- **Disadvantage of a forced-ordering system**
  - Orders for some items may be for small quantities
    - B/c all items are ordered regardless of the stock on hand

Types of Max-Min Inventory Control Systems…

- **Forced ordering variation: delivery truck system**
  - Also called a **topping up or bread truck system or Vendor Managed Inventory** (VMI) system.
- Difference b/n **regular** vs **delivery truck** forced ordering system
  - The **way the deliveries** are made
  - A truck is loaded with supplies at the end of the review period.
  - The truck and a delivery team travel to each facility
  - Assess the stock & leave (top up) an amount of each product

- **Advantages of the forced-ordering: Delivery truck system**
  - The **order** is filled on **the spot**
    - The **lead time** is zero → lead time stock to zero
    - **Lowers** the min and the max stock levels
  - **Damaged** or expired products can be put back **on the truck for disposal**
  - The truck can be sent out with a **full load** of supplies, **eliminating multiple small orders**.
  - The LMIS **report** can be **completed** and **collected** at the time of delivery
    - Avoid delayed reporting

Types of Max-Min Inventory Control Systems….

- The **training** requirements are significantly **less** for the facility staff.
  – If a supervisor goes on the truck for deliveries, **on-the-job** training and **supervision** at the various stops
- **Disadvantages of the forced-ordering delivery truck system**
  - All types of max-min systems **rely** on their **delivery trucks**.
  - System is vulnerable to breakdowns
    - The whole system breaks down

Types of Max-Min Inventory Control Systems….

- A **sufficient** number of staff must be available in the office
  - team leaders are away making deliveries
- Require **larger** trucks
  - **Always carry more stock** then they will actually deliver
- **Continuous review max-min system**
  - Store keeper decision rule
    - **Review** the stock level of each item **every time** you make an **issue**.
    - If the stock level is at the **min, or has fallen below** the min, **order** enough stock to bring the level up to the max.
  - The least appropriate for most health programs….why????

Types of Max-Min Inventory Control Systems….

- **In a continuous review system**
  - The review period is **not fixed**
  - The storekeeper **must know** both the **max** and **min** stock levels.
  - The storekeeper does **not need an emergency order point**
    - Order can be placed any time stock is needed.
  - The **storekeeper** must assess stock status **each time an issue** is made.
    - Storekeeper's **workload increases** if there is many item
  - The storekeeper must be able to order – pull system
    - b/c only the storekeeper determine stock level (min or not)
  - A continuous review system must be a **pull system**.

Types of Max-Min Inventory Control Systems….

- **Advantages of continuous review max-min system**
  - Rule for resupply is **simple**: reaching minimum
  - The **system** is more **responsive** and **flexible**
    - ✓ orders can be placed at **any time**.
- Small orders are eliminated
  - ✓ stock levels are at the **min** when an order is placed.
- **Disadvantages of a continuous review system**

– Transportation resources are **harder to schedule**.

– **Overload** storekeepers in large facilities with a large number of products

Types of Max-Min Inventory Control Systems….

- **Continuous review system variation: two bin**
  - Resupply rule is the same
  - The difference: the way of determining when the min has been reached
  - Two equal-sized bins of each i**ndividual** product
  - When the **first** bin is **empty**, the **min** has been reached

Types of Max-Min Inventory Control Systems….

- **Advantages continuous review system variation: two bin system**
  - Require **less training** than a normal pull systems: empty bin
  - **No calculations** are required and paperwork is minimal
- **Disadvantages: two bin system**
  - **bin size** must be continually reviewed
  - If consumption for products is not stable
- **Standard max-min system**
  - Resupply (when to and how much to order) is based on
    - Reviewing all stock levels at the end of each review period.
    - Falling below the min

Types of Max-Min Inventory Control Systems….

- In a standard system;
  - Ordering/issuing new stock is based on the min stock level and the review period.
  - The storekeeper must know the min, max, and review period.
  - An emergency order point is needed;
    - To ensure that a stock out does not occur between review periods.
  - The stock status must be assessed at the end of each review period

Types of Max-Min Inventory Control Systems….

- **Advantages of standard max-min system**
  - Eliminate small orders
  - Avoid the need to assess stock status continually
  - Reduce the number of calculations
  - Transportation can be scheduled for specific times
- **Disadvantages of standard max-min system**
  - Higher min stock level
  - Increase the likelihood of expiry
  - Require more storage capacity,
  - Increased costs
  - More training for the storekeepers may be required
    - b/c of their decision rules are more

Quality Assurance for Drug Procurement

- **Drug quality**
  - Quality of the final drug product is determined by;
    - Raw material (ingredient)
    - Equipment
    - Technical knowhow
    - Packaging
    - storage
- Defining assessing drug quality
  - Establish quality standards: e.g. BP, USP, EP,IP
  - **Identity, Purity , Uniformity of dosage form, Bioavailability: Bioequivalent, Stability etc…**
  - Analytical methods: for **newly marketed** drug when the standards are not established

Drug quality assurance…

- **Consequence of poor drug quality**
  - Lack of therapeutic effect may lead to prolonged illness
  - May induce **toxic** or **adverse** reactions
  - **Wastes** money
  - May affect **program credibility**
- **Practical approaches to quality assurance**
  - **Careful product selection**
    - ✓ **Powders** for reconstitution instead of **injectable** liquids
    - ✓ **Powders** for reconstitution instead of **oral suspensions**
    - ✓ **Tablets** instead of **capsules**
  - **Careful supplier selection**
    - Certification, supplier reliability, product quality
    - inspecting product sample

Drug quality assurance…

- **Certification of GMP** : **cGMP** certificate
- **Batch certification**
- **Inclusion of detailed specification in the contract**
  - Name of the **pharmacopeia** reference standard to assess drug quality
  - Language for the product **label**
  - **Minimum information** required on the label
  - Additional information such as **product registration**
  - **Standard for packaging:** Withstand storage and transport conditions
- Procedures to verify that the shipped good meet the specification.
  - **Pre and post shipment inspection**
  - Analytical drug testing

Drug quality assurance…

- Procedures to monitor and maintain the quality of drug
  - **Proper storage** and distribution procedures
  - **Appropriate dispensing**
  - **Instructions** to the patient on proper use of medications
  - **Product defect reporting programs**

Drug Donation

- **Disaster** and suffering: Donation of medicines
- **Problems with drug donations**
  - Donate drugs are often **not relevant** for the emergency situation or for the level of care that is available
  - Health workers are **not always familiar** with donated drugs
  - The drugs are often not registered for use in the recipient country
  - May **not comply with local** treatment guidelines

Drug Donation….

- The drugs that arrive are frequently **unsorted, difficult to identif**y, unknown in the recipient country, labeled with brand names or a labeled in a language that is not locally understood
- The **quality** of the drugs does not always **comply with standard in the donor country**.
- Donated drugs may have expired or may expire before they reach the patient, or they may be returned drugs (half finished packages that have been returned to the pharmacy
- The distribution plan often ignores normal administrative procedures.
- Donation of **returned** drug

Drug Donation…

- **Core principles of donation**
  - **Donation** should be intended **only to assist** the recipient and all efforts should be made to maximize its positive effect.
  - Donation should be given **with full respect of the authority of the recipient** and be **supportive** of existing government policies and administrative arrangements.
  - **No double standard** should be applied: if the quality of an items is an acceptable in the donor country, it is also acceptable in the donor country
  - **Effective communication** must be maintained between the donor and the recipient: donation should be based on expressed need and should be sent unannounced